



International Cooperative Education: The European Experience for Students in Chemistry

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Received 24 October 2003; accepted 8 March 2004

The professional training or cooperative education program for chemistry degree students at the University of Surrey in the UK is presented, with specific reference to the requirements for European chemical company placements. The program involves placements in various countries, including France, Belgium, Germany, Switzerland, Greece and Sweden. The candid opinions of two chemistry students who were on twelve month placements in Germany and Belgium shows clearly that a well organized program can provide a unique opportunity for students to acquire language, social and practical chemistry skills. In particular, problem solving, especially overcoming language barriers and cultural attitudes, and financial needs are important areas to be addressed by the student. Key administrative issues for the university include local work or residential requirements, insurance/health policies, 24-hour emergency contact numbers, and strong academic-industrial links for dealing with problems. (*Asia-Pacific Journal of Cooperative Education*, 2004, 5(1), 27-34).

Keywords: International exchange; chemistry; United Kingdom; Europe

Chemistry, School of Biomedical and Molecular Sciences, University of Surrey has for more than 20 years been involved in placing undergraduate students in European chemical companies as part of a single twelve month (or more) professional training, cooperative education or industrial experience program. For all of these students such a placement is an integral part of their four year undergraduate degree program as they are studying for a MChem degree involving Chemistry with a European Experience (German or French). However, in recent years many Surrey students undertaking other MChem Chemistry degrees (Chemistry, Computer-aided, Management, Analytical and Environmental, Analysis and Instrumentation) have also worked in chemical companies in France, Belgium, Germany, Switzerland, Greece and Sweden. The industrial placement occurs between the second and fourth years of the degree and for many students this placement provides them with the opportunity to live outside the United Kingdom, an experience they may only have had whilst on a family holiday to Europe. Overall, this type of international cooperative education placement provides an excellent opportunity for the student to expand their chemistry knowledge whilst working in a European country. The experience also provides an exciting and

sometimes challenging environment in which to learn new 'life-skills', including learning a new language, adapting to local social/cultural customs, problem solving when things go wrong, and so.

This paper reports on how the European professional training (as it is known at the University of Surrey) program is administered in Chemistry at Surrey. It also provides the reflections of two undergraduate students who during their third year of study (2002-2003) were on a placement at chemical companies in Germany and Belgium. A review of the potential problems and solutions is also included to provide other educational or industrial partners with an insight into the 'other aspects' of such international cooperative education programs.

Professional Training – Chemistry, University of Surrey

The University of Surrey is a pioneer in the field of integrated professional training (professional training) in the UK. Each year more than 90% of our chemistry undergraduates complete a professional year as part of their degree requirements. In Chemistry, as throughout the University, there is a senior tutor (the first author) who is experienced in placing and supervising students in industrial

companies or professional bodies. The overall University of Surrey professional training program is coordinated by the Professional Training Committee (professional training), on which the senior tutors are represented. Professional training establishes and controls the rules and assessment schemes relating to the placement programs for each School or Department. Each senior tutor is provided with a centrally-controlled budget which enables academic tutors to make regular industrial site visits (at least three for each student per year). Such a system enables student assessments to be undertaken through continuous monitoring programs at the professional training workplace (by both an industrial supervisor and a visiting academic tutor/supervisor who is a specialist in the subject area of the student work program). Each site visit ensures that close links are maintained throughout the placement year between the student, tutor and employer. In addition, problems can be quickly resolved and a student's training performance can be closely monitored so that individual interests, academic strengths and career ambitions correspond to both student and employer requirements (Surrey, 2003).

Students reading for a MChem degree are awarded: (i) 40 P-credits (an assessment of performance by both the industrial supervisor and a visiting academic tutor during three site visits, combined with marks for an oral and poster presentation on Industry Day), and (ii) 80 academic (level M) credits which contribute towards 10% of the overall degree award assessment.

Professional Training in the Chemical Industry

The Surrey chemistry professional training program involves approximately 50 to 60 students per year with about five to eight of these being placed in European and Worldwide chemical companies for twelve months or more. Over 85 companies are listed for potential placements covering traditional industrial, pharmaceutical, computational, analytical, environmental regulation, forensic, management and language-based (French or German) chemical opportunities. In 2003-2004, the placement stipends ranged from £9,500 to £25,000 (with an average of £13,500), although some companies provide 'packages' to supplement the monetary award offered for the placement (refer to the third author case study). Salaries at the bottom of the range are normally associated with placements in Australia or New Zealand (and reflect the local rate of foreign exchange against UK sterling) and the top is for European placements in Switzerland (which has a higher standard of living than most EU countries). Students on placement in European Union (EU) countries also receive a supplement of ca. £3000 as part of their involvement in the Leonardo project (Burden et al., 2003) run jointly between the EU and the University of Surrey (see the second author case study).

The professional training scheme in chemistry is closely linked to the academic program during the first two years of study. Specialist modules in Scientific Communication are undertaken to develop the student's oral and written presentation skills (as individuals and groups). In year 2 the students prepare a curriculum vitae (with advice provided by

the Surrey Careers Department), and are given practical work in completing chemical industry application forms and preparing for interviews. At the beginning of year 2 the senior tutor (ST) interviews all students wishing to take a professional training placement (and who have satisfied the MChem degree regulations of having an overall mark of 50%). This enables the ST to direct the student into an area that corresponds to individual interests, academic strengths and/or career ambitions. Chemical company positions are displayed on a professional training notice board and a regular update of positions is sent by E-mail to all students. Students wishing to pursue a particular placement position complete the application form which is then forwarded to the company by the professional training Secretary, along with the curriculum vitae, academic record (if requested), photograph and a hand-written letter from the student outlining why they want a placement and what they have to offer. All subsequent interviews and offer documentation are controlled by the professional training Secretary. All placements also have a University of Surrey Placement Agreement that covers the responsibilities of all parties. In many cases, chemical companies also request a Confidentiality Agreement to be signed by the student and ST.

Students wishing to undertake a European professional training placement fall into two groups. Firstly, there are those that are reading for a MChem degree in Chemistry with a European Experience (German or French) who will undertake separate modules in their language choice, at levels 1 and 2 of their degree program (refer to the second author case study). Secondly, those undertaking 'other' Chemistry degrees and have decided and been accepted for a European placement, usually will extend their foreign language knowledge (based on Year 10 GCSE) by taking supplementary language classes offered by the university. This is not a compulsory requirement for the European program, but most students will do this so as to gain confidence before taking up the placement in Europe. Some students are also offered the opportunity to complete further language training whilst at their company, financially supported by the company or the EU Leonardo Scheme (refer to the third author case study).

European professional training placements are also arranged in a slightly different way to UK-based opportunities, as described above. Most of the European chemical company representatives that Chemistry interact with are based on many years of experience in placing students in their companies. Therefore, applications are made directly to the Human Resources Manager or industrial placement tutor of the company. Some companies, especially German and Swiss, then send their tutor to the UK to interview the students at the university. As part of this arrangement the University of Surrey financially supports those students being interviewed by arranging a 'social evening' with the company representative. This then provides an informal opportunity to meet each other and also enables the industrialist to view how the student 'interviews' in a social environment. This is an important aspect as the potential professional training student is not only being assessed for their chemical

knowledge and skills but also for their 'social interactions' which may be important in living in a foreign country. Other European placements may be a result of a telephone interview, especially those in Belgium, France, Greece or Sweden. This poses another problem for the student as they need to use 'telephone communication skills', a subject covered in the Scientific Communication course (Level 2).

Students start their placements in June through to early September. Most European professional training students start in late August or early September as many European chemical companies participate in an August shutdown period for plant or instrument maintenance or employee holidays. Within the first week at the company the student must complete a 'Professional Training Student Record Form' and a 'Health and Safety Checklist' which are then sent to the professional training secretary. European students also need to register with the local authorities or make special arrangements about local tax requirements. Throughout the placement period there are regular departmental newsletters and student union student Chemical Society documents sent to the students which enable them to be kept informed about University activities. After approximately three months the ST or an appointed academic tutor will arrange a date for the first placement visit. Throughout the year the student will receive three to four visits. On each occasion the visiting academic tutor will expect to be provided with an oral presentation (ca. 20-30 minutes), a detailed tour of the laboratory, and an inspection of workbooks and/or computer files. Students undertaking the MChem with a European experience give their oral presentation in the national language. This may not be the official language of the company as many of our students are placed at USA, European-based R & D sites where English is usually spoken as the working language. The student must also provide details of their 'Management Timetable' and 'Action Memos' (a record of student-industrial supervisor meetings and deadlines). All students also complete a log-book which covers their monthly objectives, a record of work undertaken, action points and a separate section on self-assessment of their placement activities (including interaction with others, planning, timekeeping, etc). During a visit the student will also be questioned about Health and Safety (H & S) aspects of the placement, including the fire alarm procedures, use of a carbon dioxide fire extinguisher, and Control of Substances Hazardous to Health (COSHH) documentation for chemicals being used in the placement. This is also a very important aspect of European placement visits as many European countries use different health and safety policies or even have a different attitude towards the implementation of health and safety in the workplace.

Assessment of Professional Training in the Chemical Industry

Assessment of the professional training year is based on 40 P-credits and 80 academic (level M) credits. The learning objectives include: (1) Knowledge of industrial work and the working practices of the company (Health and Safety, COSHH, Quality Control procedures), (2) application of

theory and practical skills in the chemical industry, (3) problem solving, (4) development of communication skills (oral and poster), (5) teamwork and self-reliance, and (6) development of professional habits including planning/preparation, organization of daily/weekly activities (timetables), notebook records, interaction with industrial supervisor (Action Memos); and report writing skills.

Table 1 reports the scheme of assessment for a single 46-week minimum - MChem degree professional training placement in Chemistry. Overall, the industrial supervisor makes a 45% contribution towards the total assessment. The 40 P-credits are based on two components. Firstly, assessment by both the visiting academic tutor and industrial supervisor of the student's performance after ~ 3-4, 6-7 and 9-11 months (during site visits) according to the specific course aims of: (1) Satisfy the employer's requirements concerning initiative, interaction with other staff, use of literature, report writing and practical skills, and (2) satisfy the visiting tutor's requirements concerning knowledge of industrial work, communication skills and overall professional training performance.

Students should be able to show that they have developed:

- An awareness of initiative, dependable conduct and cooperation with supervisors and fellow employees
- Professional technical skills (practical, use of literature and report writing), and
- An improvement in their organizational and communicational skills, including work books, computer database, record keeping, oral presentations and action memos (records of supervisor-student meetings and deadlines).

Secondly, a special feature of the Chemistry professional training program is Industry Day. This provides the other component of assessment for the 40 P-credits. Industry Day is held during the first semester of the final year (Level 4) when all the professional training students provide both a poster and twelve 15 minute oral presentation covering the scientific and social aspects of their twelve month placement. Students undertaking a MChem with a European Experience degree provide both components in the language of their placement country. The Industry Day audience is made up of industrial supervisors, academic staff, post- and undergraduates, members of the University careers department, several senior professional training tutors from other Schools and Senior Executives of Surrey.

The 80 academic (level M) credits are assessed by a committee comprising the academic tutor who made the three industrial site visits (and completed the level P assessments) and two further academic staff who are familiar with the field of chemistry covered in that particular chemical company. The department also has academic staff who can speak French or German and therefore they assess the Chemistry with a European Experience student presentations and documents. The oral viva consists of a 20 minute presentation followed by a 25 minute question and discussion period. All level M documents and assessments are inspected by an External Examiner, as they contribute

Table 1

Assessment in Chemistry for MChem degrees: 40 P-credit and 80 academic (level M) credit values.

Credit	Scheme	Credit value
P	First assessments by visiting tutor and industrial supervisor after - 3-4 months	5
P	Interim assessments by visiting tutor and industrial supervisor (~ 6-7 months)	5
P	Final assessments by visiting tutor and industrial supervisor (~ 9-11 months)	5
P	Industry day student oral and poster presentations	25
M	Assessment of 6-month Industrial Report	10
M	Assessment of 12-month Industrial Research Report	40
M	Oral viva of Industrial Research	30

towards 10% of the final degree award (degree: level 1-0%, level 2-35%, level M-10%, level 3-55%).

An essential overview of any international cooperative education scheme should include the opinions of the students (Beard & Coll, 2001; Wong & Coll, 2001).

Case Studies of Students on Placement in European Chemical Companies

Frost (the second author) is studying for a MChem degree in Chemistry with European Experience (German). His Professional Training placement was with a multinational chemical company in Northern Germany. Laura Yonge (the third author) is completing a MChem in Chemistry and chose to undertake her industrial training in Belgium at a European cement company. Both were also involved in a Leonardo project investigating how the skills of professional training students on European placement develop and provide a basis for their future careers.

Second Author Case Study

Facts

- MChem in Chemistry with European Experience (German)
- Age – 22 years
- Educational background – French baccalaureat S.T.L. in Science and Laboratory Techniques; Ecole Nationale de Chimie, Physique et Biologie, Paris
- Placement – major US-based Chemical Company in Northern Germany
- Work description: chemical synthesis and new analytical method development for alternative chemical products
- Placement details – 12 months, started in August 2002, salary ca. 12,000 Euro, holiday entitlement 28 days, working hours 8am to 4-30pm - flexitime included.

The following text has been provided by the second author

- (i) How well did the university prepare you for your placement with particular reference to a European placement?

My degree is “Chemistry with a European Experience -

German” and I can say that the university prepared me very well, from a language point of view. Throughout my first two years at university, I had to attend four hours of German lessons a week, two hours of which would be based on grammar, written and oral exercises, for which I had to give presentations and write reports. The other two hours were focused on German culture, the social system and German administration/law. I can confidently say that all the topics covered during those lessons were highly relevant and useful for my placement.

Before we started applying to companies the career adviser (Surrey Careers Service) gave us his opinion on industrial placements and stressed how important they were for our future career. Also, over the first two years I attended a course called “Scientific Communication”. This module was a highly valuable asset that taught me a whole host of skills that are extremely useful in industry, for example presentation skills, report writing and teamwork. Furthermore, application and interview techniques were also practiced.

- (ii) What did you do for yourself once you decided that a European placement was a possibility?

First I went to see my personal tutor and asked him what advice he could give me. Following this I contacted various students from the department that had previously been to Europe for their placement and got them to tell me about their experience. I also found out what kind of companies had previously offered placement positions in Europe for Surrey Chemistry students. I then found out more about these companies, researching on the Internet and in the university Career’s Office. This helped me make an educated decision on what type of company would be best for me.

- (iii) How did you prepare yourself?

I wanted to get to know the culture and the life style in Germany by seeing it myself. So at the end of my first year I decided to put my name down for a four week German course with the Goethe Institute, in Munich. I also asked my German teacher to give me a translation of basic chemical terms, which was very useful at the beginning of my placement. A week before I was due to start my industrial placement I browsed through my German lesson and grammar books, to soften the transition of being in an English spoken environment to a German one.

- (iv) What did your company do before you started and once you arrived ?

Before I started my industrial placement, I received a series of information packages, which were at first general facts and figures about the company. Then the information was more specific to my placement, the site and the town that I would be working in, my wages and the housing arrangement provided by the company. Articles written by previous students were included, describing what their experiences were, what is worth doing and areas to visit in the region.

I also had forms to fill in and send back to the company that asked for general information and my specific details. Information on my housemates was also sent to me, so that I could get in contact with them.

Once I had arrived, the member of staff that recruited me was there to pick me up at the station and drove me to the company house that I was going to be staying in for the twelve month period. During the first days at work that same person guided us through the signing of our contracts and confidentiality agreements. He also took us into town to open German bank accounts, took care of all the paperwork regarding the tax office and work permits. On the second day he introduced us to our industrial supervisors who took over at that point. For the first month my supervisor taught me all the safety rules, the background of the project that I was joining and the main chemistry aspects of my daily work. During that time I was also assigned to a laboratory technician that taught me all the measurement techniques that I was going to use for the project.

Within the first month I had to go through a medical test and a whole list of safety/hygiene briefings. I was shown how to use the library and was also given an E mail address.

- (v) What are the local requirements for working in a company in Europe, with Germany being an example?

There are no real requirements to work in Germany so long you are part of the European Union. But on a general note, one should have a basic understanding of the language or a desire to learn German in and out of working hours. Furthermore, you need a will to experience a different culture and work practices.

- (vi) Arrangements for accommodation, transport, medical/dentist cover, etc.

As I mentioned above the company provided the accommodation. The company owns a house that is situated on the outskirts of a town, near to the company. The rent and the bills are highly subsidized by the company. The company also provides students with a bicycle as a means of getting to work and into town.

The company has a medical centre where every employee has a medical and regular check-ups. One can also make an appointment with the doctor if the need occurs. Free medicines are provided to employees to cure banal illnesses i.e. colds and flues. The doctor will also recommend you to more specialized doctors if the need arises. I also took out a travel insurance policy that covers my medical requirements whilst in Europe. This was subsidized by the Leonardo project.

- (vii) Language and cultural preparation and problems

I think that to make the most of the experience of being abroad one should have at least a grounding in German, even if very basic, in order to have something to build-on. On the other hand, no matter how good your German is you can be sure that the first few months will involve a steep

learning curve, especially on the technical side. But it is still true to say that one can manage with English because most work colleagues have a reasonable knowledge of English. The Leonardo project also subsidizes extra German lessons once on placement so I naturally took lessons twice a week at a local adult school.

My German lessons at university prepared me to a certain extent in terms of the difference in culture but again there is nothing like living in the country to experience it for yourself. At the beginning of the placement there were lots to discover and work out, but my colleagues were more than happy to help me and explain how certain things were done in Germany.

- (viii) Gender differences (attitude towards the opposite sex in the work place and socially)

Up until now I have never encountered nor heard around me that there were such issues.

- (ix) Tax, money arrangements and difficulties, etc

We get paid in the local currency (Euro). As I said above we had to open a current account in a German bank. Our salary is such that we pay income tax initially but get most of it back at the end of each financial year. The first month was a bit hard because I had to pay the deposit on the house and pay for my upkeep without having been paid any wages. It is a good idea to initially come over with some money because banks don't give you a free overdraft and transfers from foreign bank accounts are still rather difficult and costly. Once I got over the first month everything was fine though.

- (x) Leonardo and any other financial support issues

The Leonardo project run jointly by EU and the university in collaboration with the company involves me filling in a monthly "learning log" (Burden et al., 2003). This task required me to think about the different experiences of the month, write about one of them and reflect on the learning outcomes. All these "learning logs" are sent to the university and in exchange I received a total of £3000 during the year. Leonardo also supports one return flight to England, expenses for an insurance policy and language tuition.

Third Author Case Study

Facts

- MChem in Chemistry
- Age – 21 years
- Educational background – 8 GCSEs, 3 A-levels (Chemistry, Biology and Business Studies)
- Placement – major European-based Cement Company in French speaking area of Southern Belgium
- Work description: routine analytical testing for mineral chemistry section and new analytical

method/instrumentation development

- Placement details – 12 months, started in August 2002, salary ~ 7,500 Euro + free accommodation and bills, holiday entitlement 20 legal and 9 compensatory, working hours 8am to 12 noon – 1-15pm to 4-45pm, flextime included.

The following text has been provided by the third author:

- (i) How well did the university prepare you for your placement with particular reference to a European placement?

The primary preparation objective was to acquire general information on the placement and the experience. This was achieved by contacting previous students with the help of the university. The current student was contactable by email and I also had the opportunity to gain a lot of insight by meeting a previous student on Industry Day. On this day students returning from industry prepare a poster, which is open for discussion and they also give a presentation that includes a brief description of their project work. In addition to this the 6-month reports completed by previous students was made available to me. More formally the university (senior tutor) briefed everyone on the assessment criteria and structure for the year and explained the relative documentation, for example, any legal obligations like confidentiality.

- (ii) What did you do for yourself once you decided that a European placement was a possibility? / How did you prepare yourself?

To prepare for my year in Belgium I arranged to have French lessons as it had been five years since I last used the language. This then provided a base on which I could build upon. I also did a lot of research into the region and country I was going to live in. This was mainly through reading literature on the Internet or books. It was also important to obtain a good insurance policy that would cover all eventualities.

- (iii) What did your company do before you started and once you arrived?

I established a telephone relationship with a contact in the Human Resources Department of the company. This enabled me to ask any questions or queries before my arrival. The company also provided me with a map locating the factory, and a letter giving essential details, such as my new address, working hours, etc. On arrival they gave me a basic induction tour of the factory and organized a colleague with good English for me to shadow.

- (iv) Arrangements for accommodation, transport, medical/dentist cover, etc.

The company organizes the accommodation and pays for all the related bills.

Transport is in the form of a bus or bicycle. During the

autumn the factory arranged for someone to drive me to and from work on my request because I considered it to be unsafe to walk or ride a bicycle in the dark. I had to take out my own insurance policy in the UK.

- (v) Language and cultural preparation and problems

In particular, I found it difficult getting used to kissing my work colleagues on the cheek every day. This is because it was strange to be that close to people I do not know. In England I would have just nodded my head and said good morning to such acquaintances, and at the most I would shake their hand.

Generally, there is not much of a language problem. In the work place everyone talks to me in English as it is the most efficient way to communicate. There are some people who do not speak English or do not want to, so communication with them is done through the small amount of French that I know, hand gestures and drawings.

One of the biggest problems with the language difference is finding technical information in English to write reports. It is also difficult to get people to describe anything technical, for example, about analytical instrumentation and the theory behind it. This is because the use and knowledge of English is not of a standard where by anything can be described in detail.

Another problem is talking to people on the telephone, which hinders the progress of my work, for example; when I need to speak to suppliers or ring the computer help-desk for technical assistance. The problem arises because we cannot see each other and therefore no body language can be used. Many people find it hard to understand both my French and English due to my accent and sentence composition.

I have found that getting people to talk to me even in French can be challenging. When people hear me speak English many just avoid talking to me due to their fear of the language difference. This can be very frustrating as I cannot learn French if no one talks to me in the language, even when they do try it often changes back to English because it is quicker and more productive. For example, nobody in my accommodation block of flats talks to me or has appeared approachable. As a result of this I have found certain situations difficult as I have felt that I could not disturb anyone and ask for help. This almost became necessary when I blew the electrical supply in my apartment and I didn't know where to find the fuse box.

- (vi) Gender differences (attitude towards the opposite sex in the work place and socially)

As a woman the attention received from men is the same. I have often found that even speaking to them in English does not deter them and typically they try their language skills and become more persistent. Generally this is not a problem but it can be unsettling when its dark and I am on my own. I have encountered a couple of uncomfortable situations and I have tried to keep these to a minimum but some are unavoidable when you live on your own in a country where you know no one. It is for this reason that I carry a rape alarm purchased from the university. I carry it with me

especially when I have to catch a train late at night. It is also for this feeling of insecurity that during my first month at work I found someone I could trust and asked for their telephone number. In this way I had someone nearby to contact if I was in trouble or had an accident. I also gave this number to my mother in case she was worried if she could not contact me. In relation to this I also brought a Belgium SIM card for my mobile so I would always have a phone in emergencies and into it I programmed the emergency services telephone number used by the country and the university.

To begin with I found social interaction at work difficult. It took me about 2-3 months to find my place in the social hierarchy and to become accepted by my colleagues. At the start it was hard to work in an environment completely of men, as I was a game to them. After a while we reached an understanding and boundaries of what was acceptable to be said or done were established. I have also found social interactions hard at work due to the large amount of internal politics that I have not previously experienced. I have had to learn how to recognize and deal with situations that have arisen and tried not to get too involved.

The Belgians have been stereotyped to be fast drivers. Unfortunately in my experience this has not yet been proved wrong. In the past this has placed me in an uncomfortable position when ever colleagues have driven me as I have felt like I was unable to ask them to slow down or it is impolite to not accept the lift offered. Drink driving is also very common in Belgium that I have found very difficult to accept and condone.

(vii) Tax, money arrangements and difficulties, etc

Each month I am paid the equivalent of £400. My accommodation is provided by the company; a one bedroom flat in a small complex close to the town centre. All of my bills are also paid by the company and a house-keeper visits once a week.

(viii) Leonardo and any other financial support issues

As I am undertaking a work placement in a country that is a member of the European Union, I am entitled to a skills-based grant. The grant is known as the Leonardo Project. Some of the expected outcomes of this project are:

- Increased awareness of own personal transferable skills and an ability to analyze these effectively as part of understanding the processes in the work environment,
- Increased foreign language competence and a greater awareness of cultural issues in relation to the workplace, and the
- Ability to take responsibility for organizing work and meeting deadlines.

As apart of the project I am obligated to write a monthly report giving details of new skills or learning experiences. In addition to this I applied for a student loan which helps to

pay for my European traveling and thus enabling me to make the most of opportunities abroad.

(ix) Health and Safety Issues

Health and safety is more casual than at the university because here you are shown the correct way once and then you are expected to take responsibility for yourself. It is also expected that the student will ask questions and to use common sense. If there is a problem then there is always someone happy to help. In the event of an accident there are the normal safety facilities, like wash solutions and emergency showers. If there are any doubts or worries then there is a Health and Safety officer in the laboratory and there is also a nurse on site.

Summary: The European Experience

The third author, who worked in Belgium, recently quoted that “offering an opportunity to live and work abroad is certainly an excellent way to learn to become a responsible citizen. In my experience it is character building, and in the process of surviving on your own you learn to become self-reliant and you see things in a broader perspective. After meeting so many new people, seeing different countries and cultures, all with different opinions and an outlook on life, I have found that I have started to adopt a different attitude towards others.” It is interesting that the opportunity to expand her chemistry knowledge whilst working in a major chemical company is probably not the major learning outcome of her European Experience. In many ways that is the success story of international cooperative education programs, in that students learn more about new ‘life-skills’ and who they are as individuals or people.

Throughout the last 15 or more years of administering the University of Surrey professional training program, especially in terms of placing students in Europe, has shown that many problems can arise and need to be confronted. In particular, it is essential that a very strong link exists between the university and industry. In the case of Surrey, the special link developed between senior tutors and company human resources managers or industrial placement tutors of major European chemical companies is an essential factor in the success of the program. It is very important that all parties, student-academic-industrial employer, are all aware of each others objectives and expected outcomes for the program. In many cases, universities are more interested in the academic requirements of the degree program, such as academic rigor to produce professional chemists, rather than the needs of the chemical company who are employing the student. Industrial supervisors want young chemists who have a high level of competencies, and the ability to apply chemical knowledge in relation to problem solving (TRANSEND, 2002). Only in recent years have transferable skills become an important component of many academic degree programs (Burden et al., 2003; Lock, 2003). Moreover, the opinions of the student need to be heard and acted upon as they are the lifeblood of the program. The two student case studies presented here show how their experiences are mixed and individualistic. In

terms of citing key issues that need to be addressed in establishing a European cooperative education network the following list comes to mind:

- The university and company must establish a strong policy on dealing with local work or residential requirements, insurance/health policies, and the financial requirements for the students
- 24-hour emergency contact numbers are essential for dealing with student problems, and
- The incorporation of ‘life and/or key skills’ (as is the case of the EU Leonardo program outlined here) can provide added benefits for the student in terms of establishing their career profiles.

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